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TO: California Regional Water Quality Review Board

FROM: Thomas M. Holsen

SUBJECT: Comments on Peer Review Draft

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The Peer Review Draft "Amendments to the Water Quality Control Plan for the Sacramento River and San Joaquin River Basins for the Control of Diazinon and Chlorpyrifos Runoff into the Sacramento-San Joaquin Delta" is a well-written, well organized report. In general I found the findings well justified and scientifically sound. Two areas of potential concern are listed below in the overarching questions section. Responses to each charge question are given below.

1. Use of freshwater water quality criteria as the basis for site-specific water quality objectives.

As indicated in the Peer Review Draft for diazinon the freshwater criteria are more stringent than the saltwater criteria. Therefore adopting the freshwater criteria for all parts of the bay would be protective for diazinon. However for chlorpyrifos the opposite is true. According to the Draft, the salinity used in the toxicity test to derive the saltwater criteria was much higher than found in even the most saline parts of the delta. In addition these saline regions are subject to tidal flushing with water that contains relatively small amounts of chlorpyrifos, and based on the data presented never exceed the proposed criteria. Therefore I believe it is reasonable to use the freshwater water quality criteria for all parts of the bay.

2. Application of loading capacity and allocation methodology to a tidal belt.

Since both diazinon and chlorpyrifos are often both present at levels of concern in the Delta Waterways, additive toxicity must be considered in determining loading capacity. To address joint toxicity the equations presented in Section 5.2.8 can be used. There are several options for determining loading capacity, for example a concentration based approach, a mass based approach, a fixed loadings capacity approach or a variable loading capacity approach. Given the hydrodynamic complexity of the Delta Waterway (including tidal flows), the temporal and spatial variability of use, and the temporal variability in rainfall amounts, I think that the only practical approach is the one proposed - a concentration-based loading approach that addresses the additive toxicity of diazinon

and chlorpyrifos. This approach is the most straightforward, and easiest to use in assessing compliance.

The proposed load allocation method in which the concentrations of diazinon and chlorpyrifos in all the water coming into the Delta Waterway would be no greater than the concentrations set by the loading capacity is a reasonable approach given the complexities of the Delta Waterway.

3. Goals for monitoring to assess compliance with the TMDL and water quality objectives in the Delta Waterways.

The alternative chosen for monitoring “provide general direction on the required monitoring and surveillance” is a reasonable recommendation in that it provides the greatest flexibility to take advantage of the different groups and agencies conducting monitoring and evaluating management practices. It is also consistent with what was recommended for the Lower San Joaquin River. The goals of the monitoring program (p. 90) are appropriate and the challenges in meeting the goals appropriately identified. Particular attention should be paid to water quality in back sloughs. A recent publication found that ecologically important back sloughs had the highest percentage of toxic samples (approximately 15% of the samples tested) (Werner et al., 2000). They also found that toxicity may have persisted over periods of several days to weeks.

The recommendation for monitoring for toxicity is critically important given the likelihood that other pollutants will be present. As is discussed below there is evidence that in the presence of some other pollutants diazinon and chlorpyrifos are more toxic than if they are present by themselves.

4. Overarching questions.

- (a) - Are there any additional scientific issues that are part of the scientific basis of the proposed rule that are not described?
- (b) Taken as a whole, is the scientific portion of the proposed rule based upon sound scientific knowledge, methods, practices?

Presence of other pollutants

The overall plan regulates diazinon and chlorpyrifos as if they were the only pollutants present. However numerous studies have found that a large number of pollutants are found in the Delta. These pollutants can act to increase the toxicity of diazinon and chlorpyrifos. For example Anderson and Lydy (2002) demonstrated that atrazine concentrations as low as 80 µg/L significantly increased the acute toxicity of diazinon to the amphipod *Hyaella azteca*. Belden and Lydy (2000) found a significant increase in diazinon toxicity to the midge *Chironomus tentans* when simultaneous exposure to 40 µg/L of atrazine occurred. Recently atrazine concentrations as low as 5 µg/L in combination with diazinon were found to cause a significant increases in the 48-h acute toxicity of diazinon to *C. dubia* (Banks et al, 2005). That study demonstrated that combinations of atrazine and diazinon produce greater than additive acute toxicity to *C.*

dubia at environmentally relevant concentrations of both pesticides. Greater-than-additive responses were also found for cyanazine in combination with chlorpyrifos, methidathion, and diazinon. Hexazinone increased the toxicity of chlorpyrifos and methidathion to the midge at 200 µg/L by 1.6 and 2 times, respectively (Lydy and Austin, 2004). Recent work that examined the effects of nine commonly detected pesticides in the Delta on the aquatic midge *Chironomus tentans* found that most of the binary mixtures elicited additive responses, however organophosphate insecticides in combination with various herbicides caused greater than additive responses (for example diuron in combination with chlorpyrifos and methidathion) (Lydy and Austin, 2004)

These studies raise questions about the regulation of diazinon and chlorpyrifos using the additive toxicity approach, which inherently assumes they are the only pollutants present. I believe the issue of the presence of other pollutant and their potential affect on diazinon and chlorpyrifos toxicity should be addressed in the Amendments. Requiring toxicity monitoring in addition to individual chemical analysis as suggested is one approach that can be used to at least partially address this issue. As noted in the document, the Basin Plan requires that “No individual pesticide or combination of pesticides shall be present in concentrations that adversely affect beneficial uses.”

Importance of Atmospheric Deposition

The study acknowledges that both diazinon and chlorpyrifos exist in the atmosphere and can undergo both dry and wet deposition, and air-water exchange. Diazinon and chlorpyrifos have been found in rain in the remote Sierra Nevada at concentrations up to 19 and 4.4 ng/L, respectively (McConnell et al., 1998). This finding suggests that atmospheric inputs contribute both diazinon and chlorpyrifos to the Delta. The sources of these pollutants could be both within and outside the Delta watershed. Although atmospheric inputs may not be important to the Delta overall, they may be important in some smaller back sloughs, particularly after long dry periods when dry deposited pollutants can be washed into the Delta with runoff. I think this possibility should be acknowledged and investigated. Some atmospheric monitoring is probably warranted.

References

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